DESCRIPTION OF TWO CASES

OF

DIRECT DISLOCATION BACKWARDS OF THE FEMUR

WITH

FRACTURE OF THE RIM OF THE ACETABULUM,

WITH REMARKS ON THE MODE OF PRODUCTION OF DISLOCATIONS BACKWARDS.

BY

FREDERIC S. EVE, F.R.C.S.,

CURATOR OF THE MUSEUM, ST. BARTHOLOMEW'S HOSPITAL.

Read January 13th, 1880.

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(Received December 1st, 1879—Read January 13th, 1880.)

Case 1.—Wm. H—, æt. 48, was brought into St. Bartholomew's Hospital dead. He had thrown himself out of a window at a considerable height from the ground.

In addition to a dislocation of the right femur, the post-mortem examination revealed a fracture of the base of the skull.

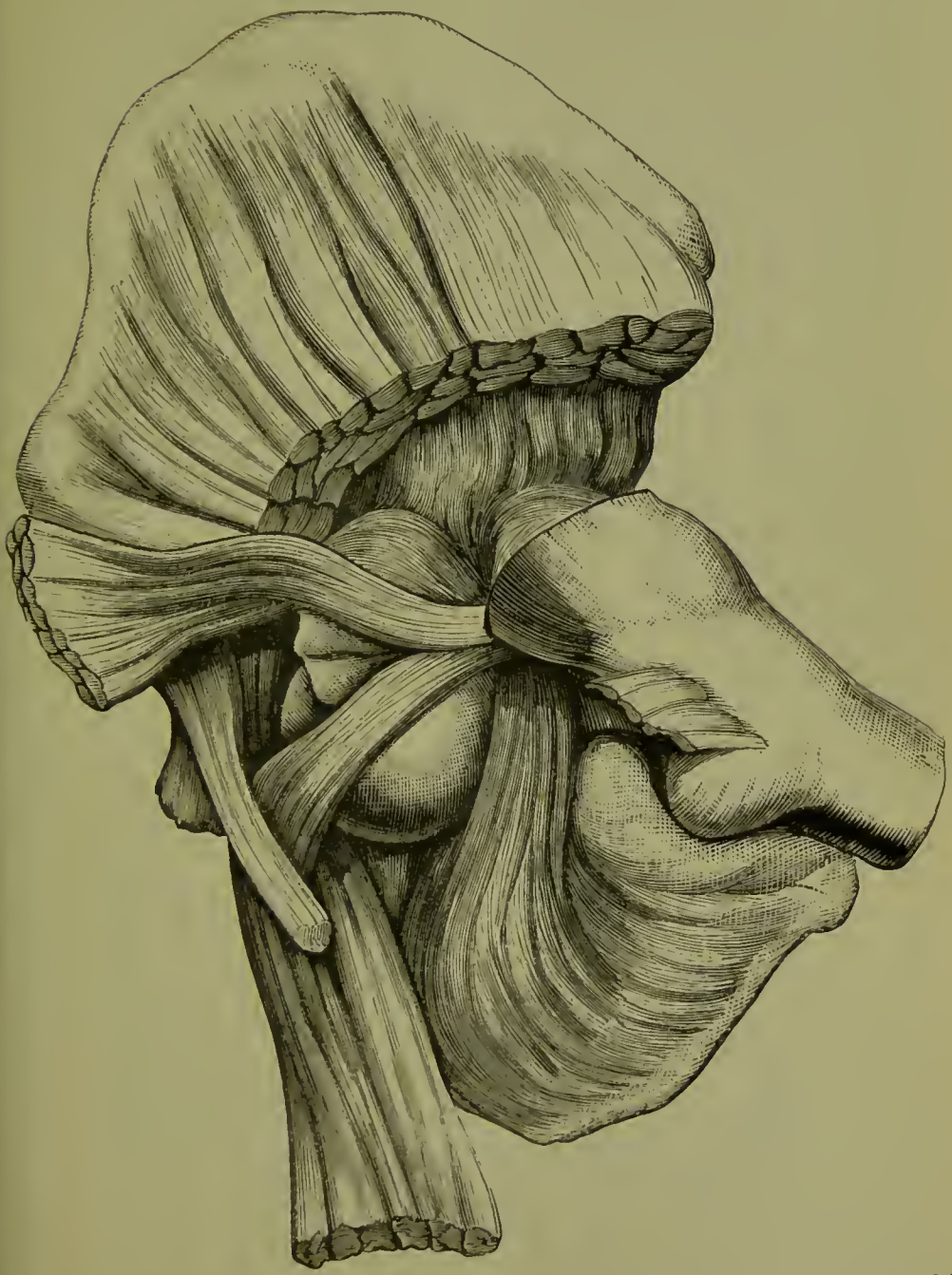
The right thigh was adducted and rotated inwards. The knee was slightly flexed and rested on the lower part of the left femur, just above the patella; the right great toe rested on the base of the left. There was some fulness in the gluteal region. The limb was remarkably rigid.

The condition of the parts found on dissection and shown in the specimen[1] is as follows (see Woodcut, Fig. 1) :—The head of the femur is seen lying on the ischium and margin of the acetabulum on a level with the lesser sciatic notch and immediately above the tuberosity of the ischium.

The sciatic nerve passes over the most prominent part of the exposed articular surface. The head of the femur is firmly bound down by the tendon of the obturator internus, which stretches tightly across it just above the level of the horizontal diameter. The posterior and lower portion of the rim of the acetabulum is broken off and pushed up above the femur, carrying with it the pyriformis, which is thus put on the stretch, but not lacerated. The rough fractured surface of the ischium is partly covered by the head of the femur, which rests upon it, and partly exposed to view. The gemellus inferior is torn across ; with this exception, all the muscles are intact. The quadratus femoris is reflected, exposing the obturator externus, which tightly embraces the neck of the femur below. The acetabular attachment of the posterior portion of the capsule is torn to a limited extent ; the upper and posterior part is intact and attached to the upturned margin of the acetabulum ; the inferior portion of the capsule covering the cotyloid notch is also untorn. The psoas and iliacus muscles were removed to expose the ilio-femoral ligament, which is not lacerated. No attempt whatever to reduce the dislocation was made until the dissection was completed. The head of the femur was found rigidly fixed by the ilio-femoral ligament, and the obturator internus, the latter of which as described above, passed across the articular surface ; both were tightly stretched. On flexing the femur the head readily glided from beneath the obturator internus, under the obturator externus to the cotyloid notch ; there was then no obstacle to reduction.

[1] Preserved in the Museum of St. Bartholomew's Hospital, Series III, No. 157.

FIG. 1.



T. Godart del.

Direct dislocation of hip backwards on to ischium; fracture of posterior margin of acetabulum, unreduced.

Case 2.—Wm. J—, æt. 55, was admitted to St. Bartholomew's Hospital under care of Mr. Willett, to whose kindness I am indebted for permission to communicate the case.

Whilst at work excavating, a large fall of earth took place upon him.

On admission he was much collapsed and complained greatly of pain in the abdomen. The left hip presented the ordinary appearances of sciatic dislocation. No attempt at reduction was made on the day of the accident, owing to the collapsed condition of the patient, but the following day he was placed under an anæsthetic and an attempt made to effect reduction by the ordinary manipulation. This failing, Mr. Willett slightly flexed and adducted the thigh, and on applying slight traction the head at once returned to the socket. From this circumstance Mr. Willett inferred that it was a case of direct dislocation backwards, probably with fracture of the margin of the acetabulum. Symptoms of peritonitis appeared, and the patient died the next day.

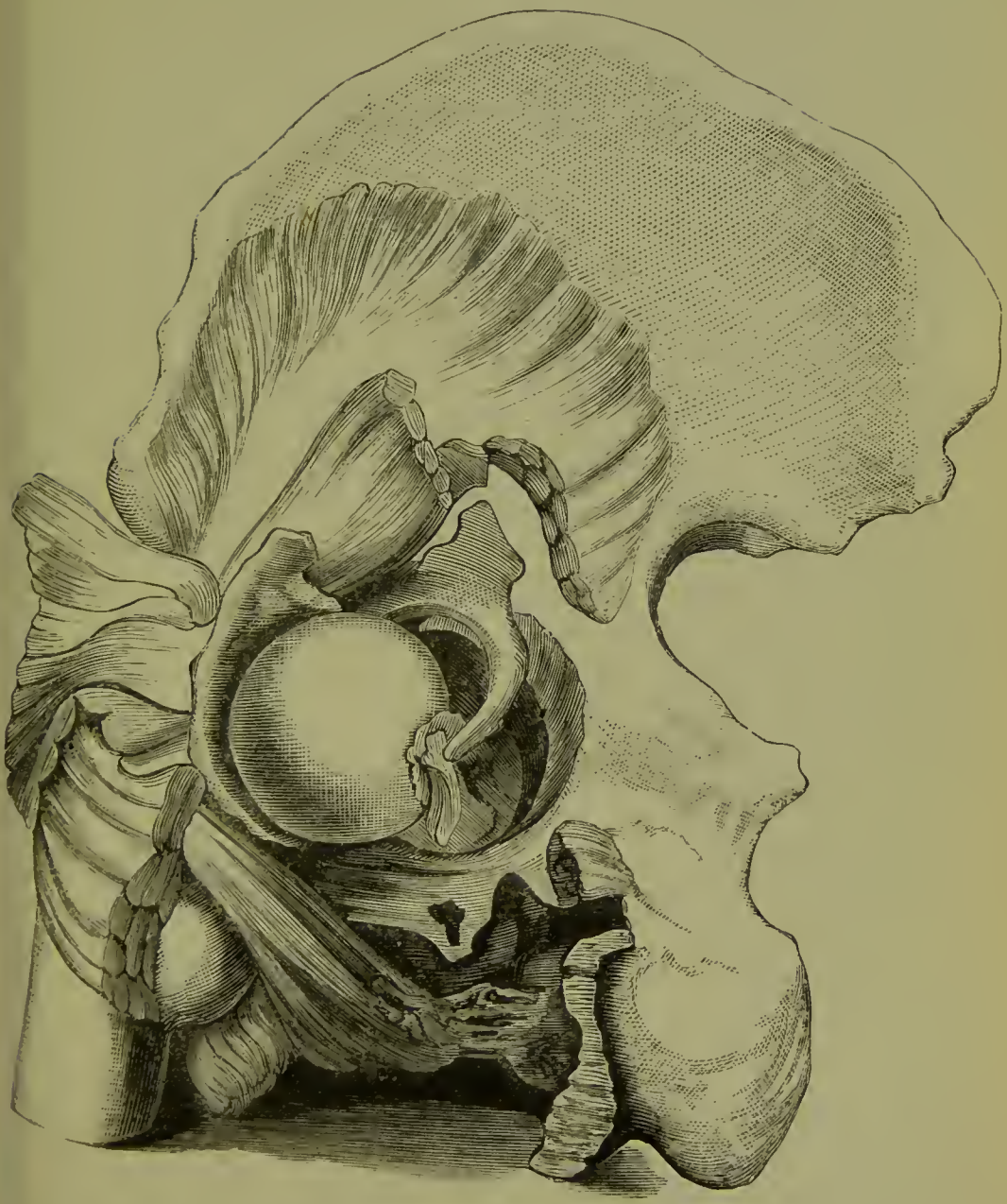
The post mortem examination revealed intense general peritonitis due to the rupture of a portion of intestine, which lay apparently in the right inguinal canal at the time of the accident. The hip was handed over to me for dissection.

The following is a description of the preparation [1] shown. (See Woodcut, Fig. 2.)

The gluteus maximus and medius have been removed; the lower part of the gluteus medius is reflected. The external rotator muscles are cut across and reflected. The posterior portion of the rim of the acetabulum is broken off and upturned. There is a corresponding rent in the capsule, which has been torn through at its acetabular insertion. The rent extends downwards to within one inch of the cotyloid notch, here it passes upwards and forwards towards the femoral attachment, leaving a narrow tongue-shaped portion of capsule still adherent to the inferior

[1] In the Museum of St. Bartholomew's Hospital, Series III, No. 158.

FIG. 2.



T. Godart del.

Direct dislocation of hip backwards into ischiatic notch, with fracture of posterior margin of acetabulum and laceration of obturator externus.

margin of the acetabulum and transverse ligament. The cartilage covering the lower and anterior portion of the head of the femur is irregularly ground off. The obturator externus muscle is slightly lacerated at its insertion ;[1] the pyriformis and gemellus superior are also slightly torn, but no other muscles were damaged. There were considerable extravasations of blood around the upper part of the femoral vein, between the gluteus medius and minimus, and into the substance of the obturator externus. From the position of the fracture of the rim of the acetabulum and the rent in the capsule, it is evident that the femur was dislocated directly backwards as in the previous case. In addition the periosteum was torn off the ischium on a level with the great sciatic notch, indicating that the head of the femur was thrown on to this portion of the bone, probably between the pyriformis and obturator internus muscles.

From the mode of occurrence of the injury, it may be assumed that the man was stooping, using his shovel or mattock, when the fall of earth took place upon his back, throwing him upon the knee, and by the sudden wrench and force of the blow, driving the head of the femur through the posterior portion of the capsule.

Remarks.—I communicate the details of these cases of direct dorsal dislocation of the hip under the impression that they will be of interest and value in themselves, but they gain additional interest from the bearing they have on a paper on dislocation of the hip, in vol. lx of these 'Transactions,' by Mr. Henry Morris. The cases related support to some extent Mr. Morris's view that "direct dorsal dislocations are *always associated* with fracture of the acetabulum, or head of the femur, or both."

In order to ascertain the absolute correctness of this statement, which, as the author avows was founded on experiments, I tabulated, after careful examination, the features of *recent dislocations* backwards in the London

[1] N.B. It has since been accidentally increased.

museums, with special reference to the following points under discussion :—whether direct or indirect, and if direct whether associated with fracture ; the condition of the inferior portion of the capsule and the relation of the tendon of the obturator internus to the head of the femur. The longest period intervening between the date of the dislocation and of death in the cases referred to is three weeks. (See Table, p. 58.)

Of the *nine* specimens tabulated *eight are direct* dislocations, only *one is indirect.* Following Mr. Morris a dislocation is described as *direct* when the head of the femur is thrown directly backwards through the posterior portion of the capsule ; *indirect,* when it escapes by abduction through the inferior portion of the capsule covering the cotyloid notch, and is then forced backwards by inversion of the limb.

The great preponderance of direct over indirect dislocations in the table is absolutely at variance with the experimental deductions made by Mr. Morris, who states, in the commencement of his paper, that he "proposes to to give reasons for believing that abduction is the position in which all dislocations of the thigh happen." The disproportion between the cases of direct and indirect dislocation cannot, I think, be to any great extent due to accidental circumstances, which led to the specimens passing into the museums.

Some allowance should, however, be made for this, as the violence must have been great in order to cause by a complication the death of the patient, as it did in most of the cases. The cause of death was, however, an accidental complication, and in nearly every case the mode of production of the injury was not of such a nature as would inevitably cause death.

Again, of the eight direct dislocations, three occurred without fracture of the posterior portion of the acetabulum, or of the head of the femur ; the possibility of which, as stated above, has been absolutely denied by Mr. Morris.

In order to substantiate the fact that these three speci-

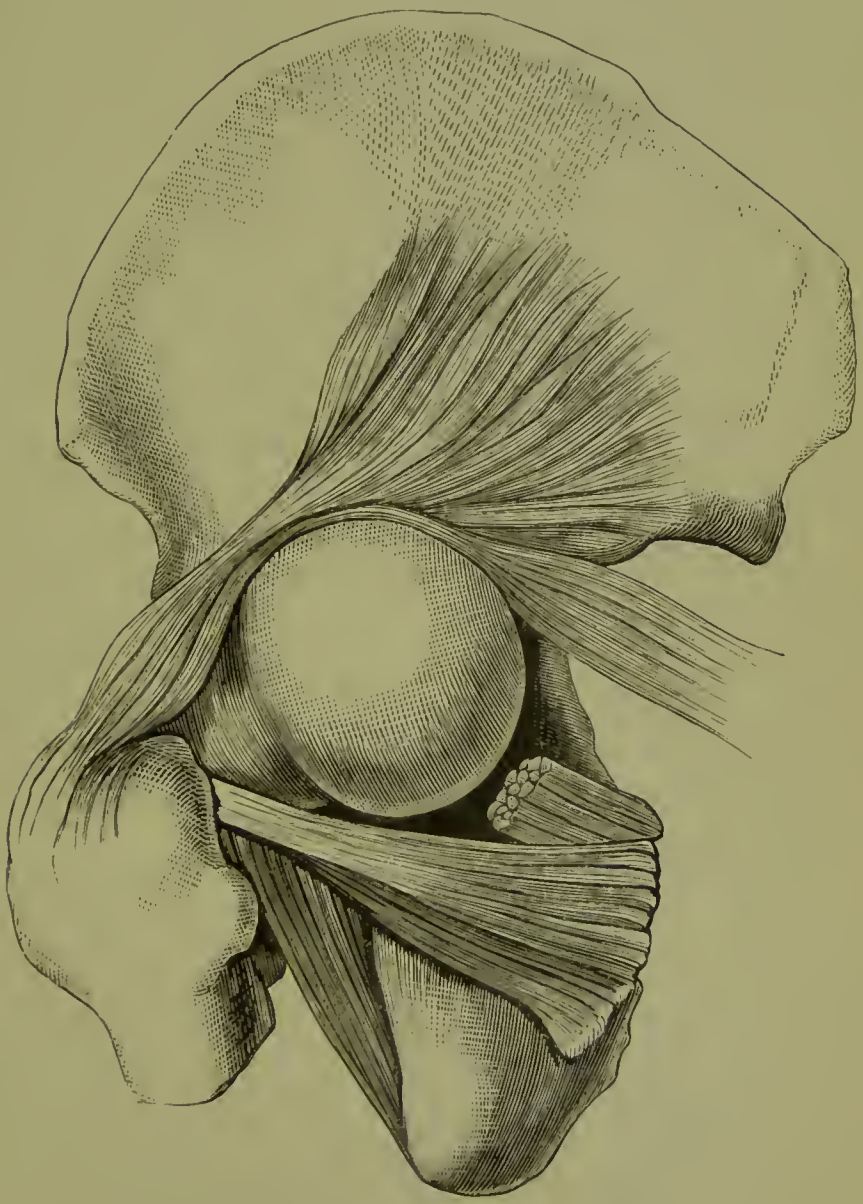
Table of Specimens of recent Dislocations of the Femur backwards in the London Museums.

Museum.	Form of dislocation.	Presence or absence of fracture.	Condition of capsule.	Relation of tendon of obturator internus to head of femur.	Reduced or not.	Cause.	Remarks.
St. Thomas's	Direct	None	Inferior portion of capsule intact	Tendon below head embracing posterior surface of neck	Unreduced	Fall of heavy casting on hip	See description by Mr. MacCormac, 'St. Thomas's Hosp. Rep.,' vol. ii, p. 143.
St. George's	„	None	Ditto, small opening in posterior part	Tendon removed	Ditto	Fall from height	This specimen shows clearly that the inferior portion of the capsule was not lacerated, and its present condition agrees with the description of the dissection in the catalogue.
St. Bartholomew's, S. 3, No. 56	„	A fracture through the ascending ramus of ischium and base of pubes, but not influencing the dislocation	Inferior portion of capsule intact	Tendon torn from muscle	Ditto	Ditto	I have taken this specimen out of the bottle and carefully examined the capsule. Case related by Mr. Wormald.*
Ditto, S. 3, No. 20	„	Fracture of posterior third of acetabulum	Ditto	—	Reduced	Not stated	Ditto. Death three weeks after injury.
Ditto,* S. 3, No. 68	„	Fracture of posterior portion of rim of acetabulum	Inferior portion not visible, posterior portion lacerated	—	Ditto	Ditto	The position of the fracture and of the laceration of the capsule indicate that it was a direct dislocation.
Case 1, related	„	Ditto	Portion over cotyloid notch intact	Tendon stretched over head	Unreduced	Fall from height	—
Case 2	„	Ditto	Inferior portion intact	—	Reduced	Fall of earth on back	—
Guy's	„	Fracture of head of femur	Ditto	Tendon below head	Unreduced	Fall from height	Related by Mr. Birkett, 'Med.-Chir. Trans.,' vol. lii, p. 133.
Hunterian	Indirect	Fracture of acetabulum	Posterior portion intact, inf. torn	In front of head	Ditto	Run over	Related by Mr. Morris, 'Med.-Chir. Trans.,' vol. lx, p. 179.

* 'Lond. Med. Gazette,' 1837.

mens are instances of direct dislocation, it will be necessary to go briefly into the evidence. Mr. Mac Cormac's case in the St. Thomas's Hospital Museum is the most

Fig. 3.



Copied from 'St. Thomas's Hospital Reports,' vol. ii, p. 143.

perfect, and the description is in every way satisfactory. (See Woodcut, Fig. 3.) The position of the tendon of the obturator internus muscle below the head of the

femur, and tightly grasping the posterior surface of the neck, with the distinct statement that the inferior portion of the capsule was not lacerated, is sufficient evidence, without going into the mode of production, which is also confirmatory. Specimen, Ser. 3, No. 56,[1] in the St. Bartholomew's Hospital Museum I have re-examined, and find that the inferior portion of the capsule is not torn. The fracture of the os innominatum in this specimen is anterior to the acetabulum, just skirting the anterior margin, and therefore does not affect the dislocation.

In the specimen at St. George's the inferior portion of the capsule, extending over the cotyloid notch and backwards to a level with the posterior portion of the tuberosity of the ischium, is certainly not torn; and, although it is a dry preparation and might be objected to for that reason, yet the present condition agrees with the description made at the time of dissection.

Cases of direct dislocation with fracture of the margin of the acetabulum appear to be comparatively common; there are four out of eight cases in the table. Bigelow mentions six cases in which this lesion was discovered on dissection, and Hamilton as many more. Probably this form of dislocation is more common than is generally supposed, because it cannot usually be diagnosed during life.

Various considerations render it probable that *indirect* dorsal dislocations by no means so greatly preponderate over *direct* dislocations as Mr. Morris maintains. In order that the head of the femur may be thrust through the inferior portion of the capsule, over the cotyloid notch, the thigh must be abducted in the extended position.[2] If, therefore, the *indirect* dislocation is the rule, the majority of dislocations backwards occur when the thigh is extended, or very nearly so. This is totally at variance

[1] Case III in the Table.

[2] The head of the femur may be forced through the inferior portion of the capsule by forcible inversion of the thigh flexed at a right angle with the trunk, but abduction, rather than assisting the manipulation, drives the head against the ilio-femoral ligament.

with the opinions of Sir Astley Cooper, Hamilton, and Bigelow, who teach that flexion and adduction is the position in which dislocations backwards occur; and reference to the description of cases clearly shows that this is the position in which a large number, probably the majority, of backward luxations take place. Further, we must assume a peculiar alternation of movements which will cause forcible inversion to follow abduction of the limb, in order that the head of the femur, after leaving the socket, may be driven upwards and backwards.

These movements, as Mr. Morris explains, occurred in the case of indirect dislocation he describes, but they are complicated and not likely to happen frequently.

The association of inversion with abduction appears less likely to be of frequent occurrence as the latter movement is normally associated with eversion. For example, it will be found impossible to straddle the legs widely apart, that is, abduct them, while the feet are inverted; and if the limb were inverted while abducted and extended, the head of the bone would be driven against the posterior and inferior portion of the capsule, and not against the thin portion covering the cotyloid notch.

These considerations lead me to infer that abduction would at least as frequently produce dislocation forwards as dislocation backwards, since abduction is more commonly associated with eversion in ordinary circumstances.

Mr. Morris states that in the reduction of direct dislocations, the manipulation, so successful in indirect dislocations, would be difficult and destructive "because more of the capsule and the small rotator muscles would have to be broken down before the head could be guided round the acetabular rim to the cotyloid notch." As the result of experiment I find, however, that it is not necessary in order to reduce a direct dislocation above the tendon, that the head of the femur should pass down to the cotyloid notch.

If the head of the bone is thrust through a limited incision at the acetabular attachment of the capsule, above the tendon of the obturator internus, it can readily be

returned by flexion and circumduction through the opening in the capsule by which it escaped; the thigh must, however, be abducted widely. By this manipulation the ilio-femoral ligament is rendered tense, and the head of the femur thus drawn into the socket.

In such an experiment if the obturator internus be divided the capsule can, as Bigelow describes, be lacerated with slight force by circumduction, and the head then returned to the acetabulum through the cotyloid notch. Therefore, in direct dislocation below the tendon, the untorn inferior portion of the capsule would not obstruct reduction through the cotyloid notch.

Because a direct dislocation backwards cannot be produced for experiment without division of the capsule, it is assumed that this form is of the rarest possible occurrence.

I have also found it impossible to produce a direct dislocation backwards either by the blows of a heavy sledge hammer, directed on the extremity or outer side of the lower end of the flexed and adducted femur; or by forcible adduction and flexion. The cause of failure is, I think, the impossibility of applying sufficient force in the right manner, since the displacement is, in by far the larger majority of cases, occasioned by a wrench, rather than a blow directly driving out the head of the femur. The mode of production of this variety of luxation appears to be as follows:—A man, for instance, falls with some violence on the outer side of his knee, the thigh is forcibly adducted and driven upwards and backwards; at the same time, the whole weight of the falling body is thrown in the opposite direction, and consequently a great strain falls on the posterior portion of the capsule of the hip-joint. Under these circumstances, as Hamilton explains, the thigh is converted into a lever of the first kind, the fulcrum of which is formed by the pelvis (against which the bone is thrown by adduction), the shaft of the femur being the long arm, while "the weight" of the body is connected with the short arm, the head of the femur only by the posterior portion of the capsule and the muscles.

Under the sudden wrench and strain the capsule is torn through at its acetabular attachment, or more frequently the rim of the acetabulum is torn off just as the tip of the internal malleolus is sometimes in Pott's fracture. The same course of events would follow the fall of a heavy weight on the pelvis while a person was stooping; or a fall while carrying a heavy weight on the back.

Rarely the head of the femur is driven with great violence upwards and backwards, and the posterior portion of the acetabulum is carried away,[1] or the head itself is fractured.[2] Of four cases of fracture of the posterior portion of the acetabulum given in the table, in three the rim only was torn off.

Passing now to comment on some of the interesting features of the two cases of direct dislocation backwards narrated, it will be observed that in Case 2 the dislocation was "*above the tendon*," in Case 1 beneath (that is, between the tendon and the bone) and "*below the tendon*."

Other undoubted instances of direct dislocation "below the tendon" are on record. Mr. Wormald's case, given in the table, is an instance, and it is cited by Bigelow as such.

Mr. William Adams[3] has also described the dissection of a "direct dislocation between the obturator internus and externus," in which the capsule was torn through in its posterior half.

A distinction between the dislocations "above" and "below the tendon," appears to be practically important, owing to some differences in the mode of reduction.

As already mentioned, I found by experiment that the head of the femur could, in direct dislocation above the tendon, be returned through the opening in the capsule by which it escaped, but that it was necessary to abduct the limb somewhat widely during circumduction in order to effect reduction; otherwise, the head of the femur passed over (posterior to) the obturator tendon, which thus lay between the head and the socket.

The failure of the ordinary manipulation in Case 2 was

[1] *Vide* Case 4, Table. [2] *Vide* Case 8, Table.

[3] 'Path. Soc. Trans.,' vol. xxi, p. 306.

probably due to this cause, and Mr. MacCormac points out that this would have occurred in his case of direct dislocation.

When the margin of the acetabulum is fractured the dislocation is easily reduced by traction on the flexed and slightly abducted thigh. This manipulation was successful in Case 2, also in a case recently admitted to the hospital, which was believed by the majority of those who saw it, to be a direct dislocation backwards with fracture of the acetabulum.

In direct dislocations "below the tendon" the head of the femur is returned to the socket through the cotyloid notch, the untorn portion of the capsule being, as already shown, no obstruction to reduction.

In Case 1 reduction was readily effected in this manner after dissection.

It is therefore evident that a dislocation cannot be assumed to be indirect because the head of the femur returns to the socket through the cotyloid notch, since a *direct* dislocation "below the tendon," and therefore not produced by abduction, is reduced in the same manner.

The rigidity of the femur in Case 1, due to the head being bound down by the obturator internus, has been already referred to.

It would probably have formerly been ascribed, as Bigelow points out, to locking of the head of the femur in the sciatic notch. The principal conclusions arrived at may be stated as follows:

a. That direct dislocation backwards does occur without fracture of the acetabulum.

b. It is probable that direct dislocation backwards is comparatively common, and frequently associated with fracture of the rim of the acetabulum.

c. That a direct dislocation "above the tendon" can be reduced by flexion and circumduction of the thigh, through the opening in the capsule by which it escaped.

d. That the untorn inferior portion of the capsule is no obstacle to reduction in direct dislocations "below the tendon."